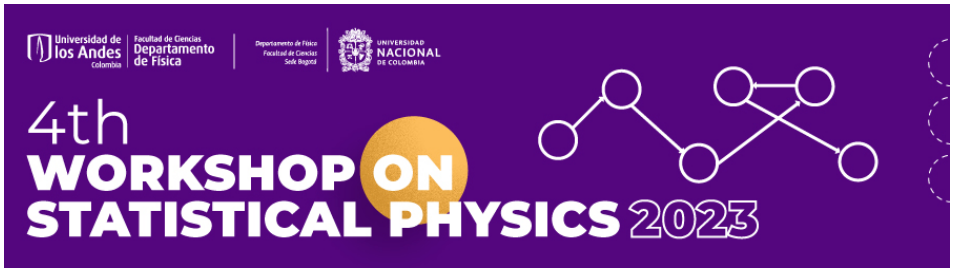


Contribution ID: **34** Tipo: **Oral**

# Theoretical Determination of Phase Diagrams using the Ising Model and Mean-Field Renormalization Groups (MFRG) with Machine Learning Tools and Monte Carlo Simulation

*viernes, 6 de octubre de 2023 11:10 (20 minutos)*

Using the mean-field renormalization group method (MFRG) and starting from the Ising Hamiltonian, magnetic phase diagrams were successfully reproduced in various systems composed of different types of magnetic atoms, such as FeMnAl, FeNiMn, and FeAl alloys. Quadratic errors we obtained below 0.016, and a preliminary approximation of the binding energy between atoms of this type was achieved. These latter alloys are of special interest since, due to their relative simplicity, they enable the implementation of machine learning when adjusting the phase diagram. This leads to a binding energy obtained through this method. Subsequently, this energy is introduced into a Monte Carlo simulation using the Metropolis algorithm.
In summary, the significance of this work lies not only in the discovery of a theoretical method for finding magnetic phase diagrams but also in the possibility of approximating the functional form of the binding energy in the Ising model.Additionally, it achieves the implementation of machine learning in this field of physics.
It should be noted that I prefer to present this work in the form of a presentation or talk.

**Autor primario:** BEDOYA RODRIGUEZ, Juan Esteban (Universidad del Valle)

**Coautor:** Dr ESCOBAR DIAZ, Leon Dario (Universidad del Valle)

**Presentador:** BEDOYA RODRIGUEZ, Juan Esteban (Universidad del Valle)

**Session Classification:** Contributed talks

**Track Classification:** Statistical Physics